

REPLACEMENT SHEET
Application No.: 09/451,090
Art Unit: 2151

Title: System and Apparatus for Storage and Transfer of Secure Data on Web
Inventor: Ravi Sandhu

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| | Domain | Flag | Path | Cookie_Name | Cookie_Value | Secure | Expiration |
|----------|----------|------|------|-------------|--------------|--------|------------|
| Cookie 1 | acme.com | TRUE | / | Name | Alice | FALSE | 12/31/99 |
| • | | | • | | • | | |
| • | | | • | | • | | |
| • | | | • | | • | | |
| Cookie n | acme.com | TRUE | / | Role | manager | FALSE | 12/31/99 |

An Example of Cookies on the Web

FIG. 1

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| | Domain | Flag | Path | Cookie_Name | Cookie_Value | Secure | Expiration |
|-------------|----------|------|------|-----------------|--------------------|--------|------------|
| IP_Cookie | acme.com | TRUE | / | IP_Cookie | 129.174.100.88 | FALSE | 12/31/99 |
| Pswd_Cookie | acme.com | TRUE | / | Pswd_Cookie | hashed_password | FALSE | 12/31/99 |
| KT_Cookie | acme.com | TRUE | / | Kerberos_Ticket | {Alice, Kc,s}Ks | FALSE | 12/31/99 |
| Sign_Cookie | acme.com | TRUE | / | Sign_Cookie | Signature_of_Alice | FALSE | 12/31/99 |

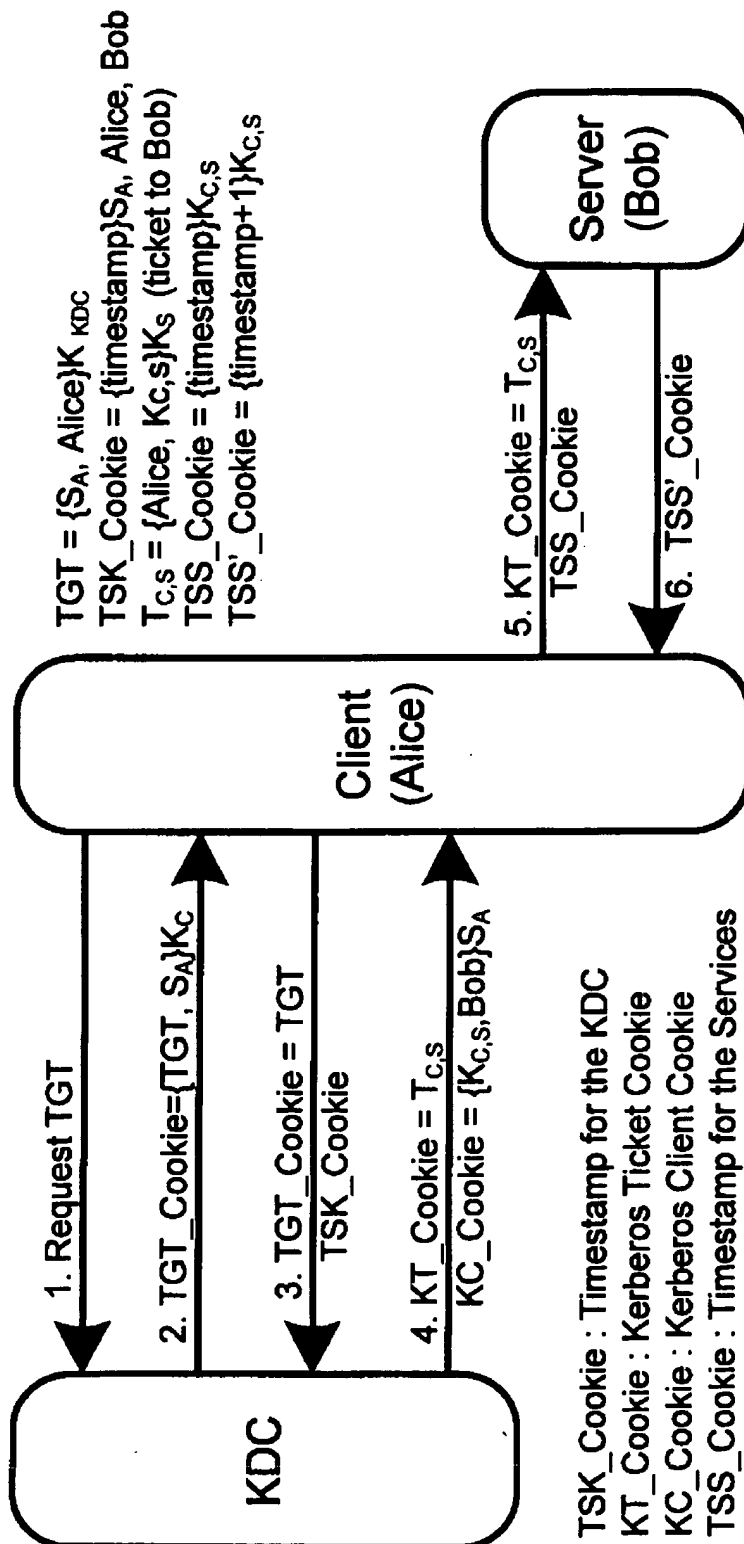
Authentication Cookies

FIG. 2

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Kerberos-based Authentication with cookies

FIG. 3

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| | Domain | Flag | Path | Cookie_Name | Cookie_Value | Secure | Expiration |
|-------------|----------|------|------|-------------|-------------------|--------|------------|
| Cookie 1 | acme.com | TRUE | / | Name | Alice* | FALSE | 12/31/99 |
| • | | | • | | • | | |
| • | | | • | | • | | |
| • | | | • | | • | | |
| Cookie n | acme.com | TRUE | / | Role | manager* | FALSE | 12/31/99 |
| Pswd_Cookie | acme.com | TRUE | / | Pswd_Cookie | mashed_password | FALSE | 12/31/99 |
| Key_Cookie | acme.com | TRUE | / | Key_Cookie | mncrypted_key* | FALSE | 12/31/99 |
| Seal_Cookie | acme.com | TRUE | / | Seal_Cookie | Seal_of_Cookies** | FALSE | 12/31/99 |

Sealing Cookies

* Sensitive fields can be encrypted in the cookies.

** Seal of Cookies can be either MAC or signed message digest of cookies.

Pswd_Cookie can be replaced with one of other authentication cookies in Figure 2

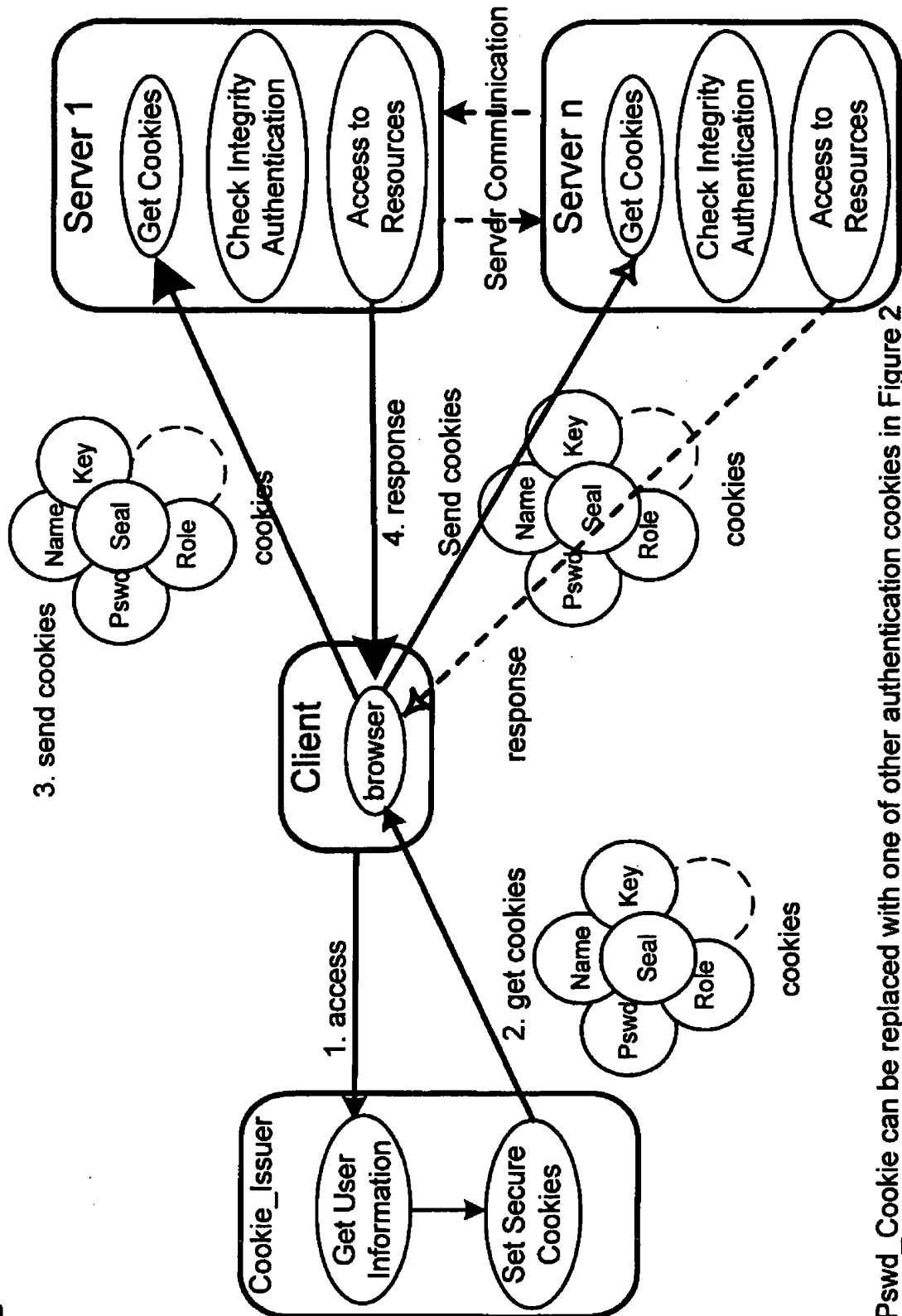
A Set of Secure Cookies on the Web

FIG. 4

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Pswd_Cookie can be replaced with one of other authentication cookies in Figure 2

How to use Secure Cookies on the Web

FIG. 5

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| Domain | Flag | Path | Cookie_Name | Cookie_Value | Secure | Expiration |
|----------|------|------|-------------|--|--------|------------|
| acme.com | TRUE | / | Name | Alice* | FALSE | 12/31/99 |
| acme.com | TRUE | / | Card | number::123456789*& exp_date::Jan.2000* | FALSE | 12/31/99 |
| acme.com | TRUE | / | Coupon | ID::123&off::10%* | FALSE | 12/25/98 |
| acme.com | TRUE | / | Pswd_Cookie | hashed_password | FALSE | 12/31/99 |
| acme.com | TRUE | / | Key_Cookie | encrypted_key* | FALSE | 12/31/99 |
| acme.com | TRUE | / | Seal_Cookie | Seal_of_Cookies** | FALSE | 12/31/99 |

* Sensitive fields can be encrypted in the cookies.

** Seal of Cookies can be either MAC or signed message digest of cookies.

Pswd_Cookie can be replaced with one of other authentication cookies in Figure 2

An Example of Secure Cookies for Electronic Transactions

FIG. 6

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| | Domain | Flag | Path | Cookie_Name | Cookie_Value | Secure | Expiration |
|---------------|----------|------|------|-------------|--------------------|--------|------------|
| Cookie 1 | acme.com | TRUE | / | Name | Alice* | FALSE | 12/31/99 |
| | | | | | • | | |
| | | | | | • | | |
| | | | | | • | | |
| Ticket_Cookie | acme.com | TRUE | / | Ticket | ID::456&Hours::10* | FALSE | 12/25/98 |
| Pswd_Cookie | acme.com | TRUE | / | Pswd_Cookie | hashed_password | FALSE | 12/31/99 |
| Key_Cookie | acme.com | TRUE | / | Key_Cookie | encrypted_key* | FALSE | 12/31/99 |
| Seal_Cookie | acme.com | TRUE | / | Seal_Cookie | Seal_of_Cookies** | FALSE | 12/31/99 |

Sealing Cookies

* Sensitive fields can be encrypted in the cookies.

** Seal of Cookies can be either MAC or signed message digest of cookies.

Pswd_Cookie can be replaced with one of other authentication cookies in Figure 2

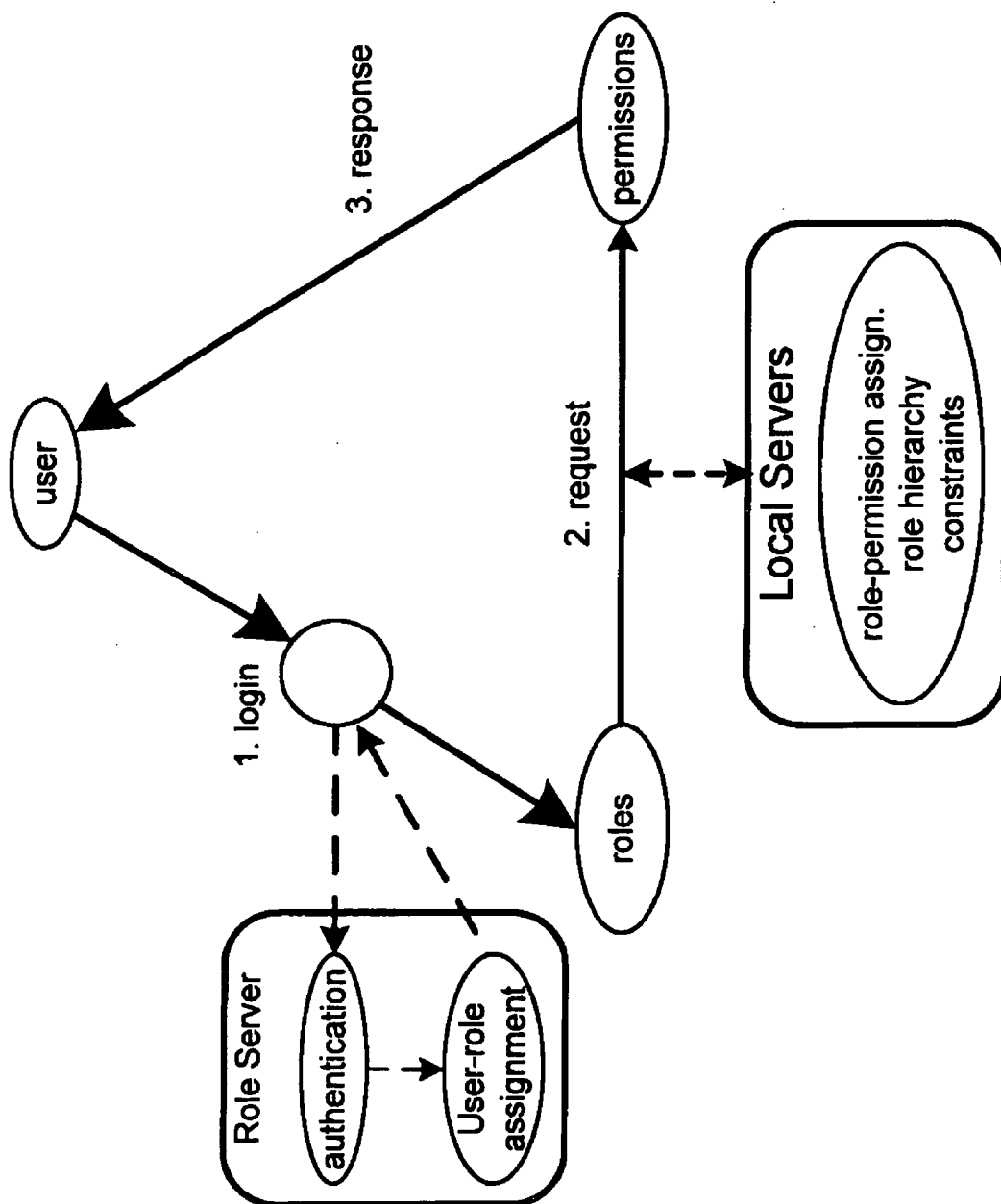
An Example of Secure Cookies for Pay-per-Access

FIG. 7

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A Schematic of RBAC on the Web

FIG. 8